

**REMARKS/ARGUMENTS**

This Amendment is in response to the Final Office Action dated October 5, 2005. Claims 1-24 are pending in the present application. Claims 1-24 have been rejected. Claims 1, 16, 21, and 23 have been amended to address 35 U.S.C. 112 rejections and to further define the scope and novelty of the present invention, as well as to correct typographical and grammatical errors, to place the claims in condition for allowance. Support for the amendments to the claims is found on page 8, lines 11 and 12. Applicant respectfully submits that no new matter has been presented. Accordingly, claims 1-24 remain pending. For the reasons set forth more fully below, Applicant respectfully submits that the claims as presented are allowable. Consequently, reconsideration, allowance, and passage to issue are respectfully requested.

In the event, however, that the Examiner is not persuaded by Applicant's amendments and arguments, Applicant respectfully requests that the Examiner enter the amendments and arguments to clarify issues upon appeal.

Applicant would like to thank the Examiner for the phone interview of June 22, 2005 and the subsequent phone conversation around December 2, 2005. We appreciate the courtesy and helpfulness of the Examiner in the interview. The claims have been amended in light of the points made by the Examiner in the interview.

**Claim Rejections - 35 U.S.C. §112**

The Examiner has stated:

**The following is a quotation of the second paragraph of 35 U.S.C. 112:  
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.**

Claims 1-8, and 16-23, are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1, 16, 21 and 23, recite the limitation "extra information", which renders the claim vague and indefinite, because it is unclear as to what "extra information" is or signifies in the claims.

Claims 2-8, 16-20 and 22 are rejected because they are dependent on rejected independent claims 1, 16, 21 and 23.

In response, claims 1, 16, 21, and 23 have been amended to address the above-referenced rejections. Specifically, the phrase, "wherein said statistical soft constraint comprises extra information along with an expression expected in an ordinary integrity constraint," has been replaced with the phrase, "wherein said statistical soft constraint comprises a value that reflects the percentage of the rows for which an expression can be expected to be true." Applicant respectfully submits that claims 1, 16, 21, and 23, as amended, are now definite under 35 U.S.C. 112, second paragraph. Dependent claims 2-8, 16-20, and 22 depend from independent claims 1, 16, and 21. Accordingly, Applicant respectfully submits that claims 2-8, 16-20, and 22 overcomes the objections for at least the same reasons as claims 1, 16, and 21.

### **Claim Rejections - 35 U.S.C. §103**

The Examiner has stated:

Claims 1-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ziauddin (U.S. Patent No. 6,029,163) in view of Schiefer et al. (U.S. Patent No. 5,761,653).

As to Claim 1, Ziauddin teaches a method, for use in query optimization in a relational database management system (See Abstract), the method comprising the steps of:

(a) generating statistical information regarding data which represents the results of an operation involving one or more columns of a database (See column 3, lines 5-22).

Ziauddin does not teach (b) deriving a statistical soft constraint from the statistical information that reflects a statistical property of the data wherein the statistical soft constraint is not necessarily valid for all of the data; and

(c) using the statistical soft constraint to estimate a cardinality value for the result of applying one or more query predicates in a query plan.

Schiefer et al. teaches a method for estimating cardinalities for query processing in a relational database management system (See Abstract), in which he teaches deriving a statistical soft constraint from the statistical information that reflects a statistical property of the data, wherein the statistical soft constraint is not necessarily valid for all of the data (See column 8, lines 3-32, where the statistical equation " $|C1|*|C2|*ff\_3=100*1950*1\%+1950$ " is read on "statistical soft constraint"; also see column 10, lines 26-13); and using the statistical soft constraint to estimate a cardinality value for the result of applying one or more query predicates in a query plan (See column 2, lines 37-41; column 5, lines 63-67; column 6, lines 18-36; column 8, lines 3-27, where the statistical equation " $|C1|*|C2|*ff\_3=100*1950*1\%+1950$ " is read on "statistical soft constraint"; also see column 10, lines 26-13).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention was made to have modified Ziauddin, to include deriving a statistical soft constraint from the statistical information that reflects a statistical property of the data, wherein the statistical soft constraint is not necessarily valid for all of the data; and using the statistical soft constraint to estimate a cardinality value for the result of applying one or more query predicates in a query plan.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to have modified Ziauddin, by the teachings of Schiefer et al. because deriving a statistical soft constraint from the statistical information that reflects a statistical property of the data, wherein the statistical soft constraint is not necessarily valid for all of the data; and using the statistical soft constraint to estimate a cardinality value for the result of applying one or more query predicates in a query plan would help the relational database management system to use the query optimizer to analyze how to best conduct the user's query of the database with optimum speed in accessing the database (See Schiefer et al., column 1, lines 48-51)...

### Response to Arguments

Applicant's arguments filed on 01-July-2005, with respect to the rejected claims 1-24 have been fully considered but they are not found to be persuasive:

In response to applicant's regarding "Schiefer does not that a unique key is a 'statistical soft constraint', the arguments have been fully considered but are not deemed persuasive, because Schiefer et al. teaches "unique keys" to estimate cardinalities. The statistical equation " $|C1|*|C2|*ff\_3=100*1950*1\%+1950$ " in Schiefer et al. is read on "statistical soft constraint" in order to estimate cardinality (See column 8, lines 3-32; column 10, lines 23-57).

In response to applicant's arguments regarding "Schiefer does not teach or suggest using the 'statistical soft constraint' to estimate cardinality value for the result of applying one or more query predicates in a query plan", the arguments have been fully considered but are not deemed persuasive, because Schiefer et al. teaches estimating key cardinality by one or more local predicates in order to select an efficient query plan (See column 2, lines 33-54, column 5, lines 63-67). Schiefer et al. also teaches the statistical equation " $|C1|*|C2|*ff\_3=100*1950*1\%+1950$ " which is read on "statistical soft constraint" in order to estimate cardinality (See column 8, lines 3-32; column 10, lines 23-57).

Applicant respectfully traverses the Examiner's rejections. The present invention provides a method for using statistical constraints to assist in estimating the cardinality of predicates by an optimizer of a relational database management system. Statistical information regarding data is generated where the data represents the results of an operation involving one or more columns of a database. Next, a statistical soft constraint is derived from the statistical information. The statistical soft constraint reflects a statistical property of the data, wherein said statistical soft constraint comprises a value that reflects the percentage of the rows for which an expression can be expected to be true. Finally, the statistical soft constraint is used to estimate a cardinality value for the result of applying one or more query predicates in a query plan.

(Summary.) Ziauddin in view of Schiefer does not teach or suggest these features, as discussed below.

Ziauddin discloses a method and system for collecting query workload based statistics on column groups identified by a relational database management system (RDBMS) optimizer and for identifying columns for which statistics collection is to be performed. The system collects workload statistics that are dependent on multiple columns, rather than merely single columns. Multi-column statistic generation provides more accurate results for columns having correlated data, and therefore leads to better estimated cost analysis by an RDBMS optimizer.

Schiefer discloses a method for estimating cardinalities for query processing in a relational database management system. The method is suitable for use with a query optimizer for estimating cardinalities for sets of columns or keys resulting from a grouping operation or a duplicate removal operation. (Abstract.) The method estimates cardinalities for a key formed from a grouping of columns in a table for use in a query optimizer for a relational database management system. Selectivities and keys associated with columns in the table are provided in

a catalog. The method includes the steps of: (a) determining an equivalence class for each column in the key; (b) for each equivalence class, determining an effective cardinality for each of the columns belonging to the equivalence class; (c) determining a cardinality for each of the equivalence classes by choosing the minimum effective cardinality for the columns belonging to the equivalence class; and (d) estimating a cardinality value for the key from the product of said cardinalities for the equivalence classes. (Column 3, lines 46-60.)

As discussed in the phone interview of June 22, 2005, Applicant agrees with the Examiner that Ziauddin in view of Schiefer does not teach or suggest the statistical soft constraint, “wherein said statistical soft constraint comprises a value that reflects the percentage of the rows for which an expression can be expected to be true,” as recited in amended independent claims 1, 16, 21, and 23.

Therefore, Ziauddin in view of Schiefer does not teach or suggest the combination of steps as recited in amended independent claims 1, 16, 21, and 23, and these claims are allowable over Ziauddin in view of Schiefer.

#### Dependent claims

Dependent claims 2-15, 17-20, and 22 depend from independent claims 1, 16, and 21 respectively. Accordingly, the above-articulated arguments related to independent claims 1 and 16 apply with equal force to claims 2-15, 17-20, and 22, which are thus allowable over the cited references for at least the same reasons as claims 1, 16, and 21.

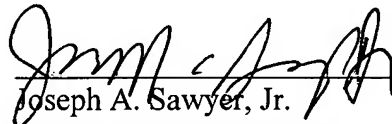
Conclusion

In view of the foregoing, Applicant submits that claims 1-24 are patentable over the cited references. Applicant, therefore, respectfully requests reconsideration and allowance of the claims as now presented.

Applicant's attorney believes that this application is in condition for allowance. Should any unresolved issues remain, the Examiner is invited to call Applicant's attorney at the telephone number indicated below.

Respectfully submitted,  
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Date

  
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